

DESCRIPTION OF TWO NEW SPECIES OF *EOSENTOMON*  
FROM THE OUACHITA MOUNTAINS OF ARKANSAS WITH A  
KEY TO THE SPECIES WITH THE 6/4 SETAL PATTERN  
ON STERNA IX/X (PROTURA: EOSENTOMIDAE)

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*Abstract.*—Two new species of *Eosentomon*, *E. megatibiense* and *E. maryae*, are described from Village Creek Park and Hot Springs National Park, Arkansas. Both species display the 6/4 setal arrangement on sternites IX/X. A key is provided to separate the North American (north of Mexico) species of *Eosentomon* that exhibit this setal pattern.

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MATERIALS AND METHODS

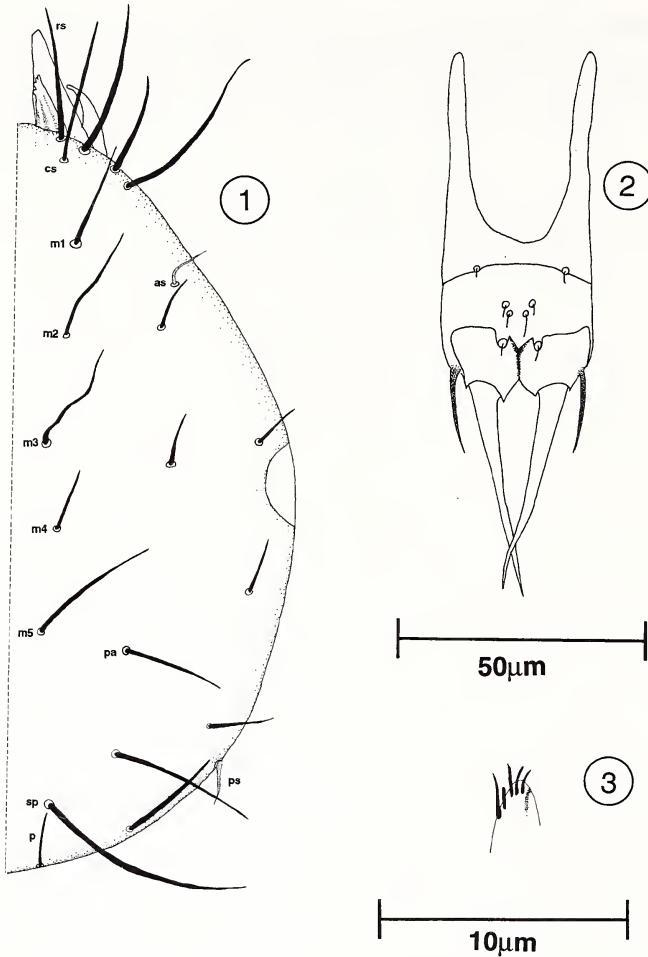
The material examined included seventeen specimens of *Eosentomon megatibiense* and twenty specimens of *Eosentomon maryae*. All material was from the T. P. Copeland Protura slide collection, currently housed at the University of Arkansas. All measurements are in micrometers ( $\mu\text{m}$ ) and were made with the JAVA Image Analysis System (Jandel Scientific) linked to a Nikon Optiphot 2 phase contrast microscope. The terminology used in species descriptions is consistent with Tipping and Allen (1994), Bernard (1990), Copeland (1962, 1964), and Tuxen (1964). Setal pattern designation conforms to Tuxen's system with the lowest Arabic numeral starting at the midline and progressing outward. Measurements of the head were made dorsally. Illustrations were made with the aid of a drawing tube attached to a Nikon Labophot 2 phase contrast microscope.

*Eosentomon megatibiense*, new species

Figs. 1–13

Body slightly sclerotized and pale yellow, with a mean length of 1,349 microns (1170–1480,  $N = 17$ ).

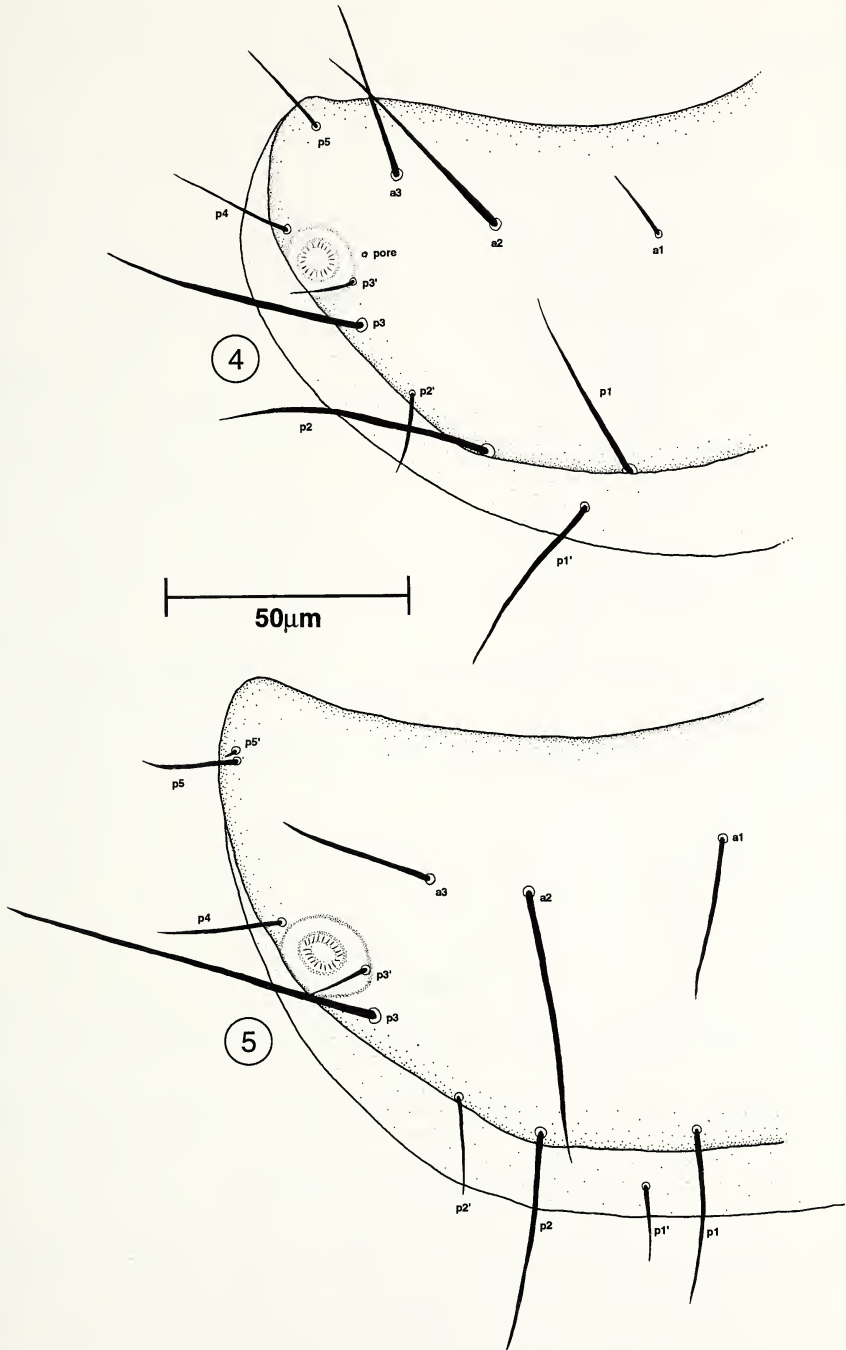
**Head.** Length of head (Fig. 1) without labrum, 135  $\mu\text{m}$  (131–140,  $N = 17$ ). Labrum medium, 14.5  $\mu\text{m}$  (12.3–15.2,  $N = 17$ ) without setae. LR = 9.8 (9.4–10.2,  $N = 17$ ). Mandibles broad, straight, and striated, with four distinct apical teeth. Digits of galea (Fig. 3) well developed, inner, median, and outer digits rounded apically with a small projection between outer digit and exterior spine. Exterior spine straight, not reaching beyond apex of galea. Outer lobe of lacinia greatly curved at distal end. First pair of rostral setae (I) hair-like without modification. Rostral setae ratio (RSR) of I and III = 0.76. Pseudoculus oval, with no visible markings, PR = 12.5 (11.7–13.8,  $N = 17$ ). Cephalic setae *aa* absent, *pa* present and long. Anterior sensillum *as* present. Seta *sp* very long, 3.1 times the length of seta *p* (2.8–3.6,  $N = 17$ ). Clypeal apodemes not distinct. Labial arm, cardo, and maxillary ramus of tentorium very distinct. Sag-



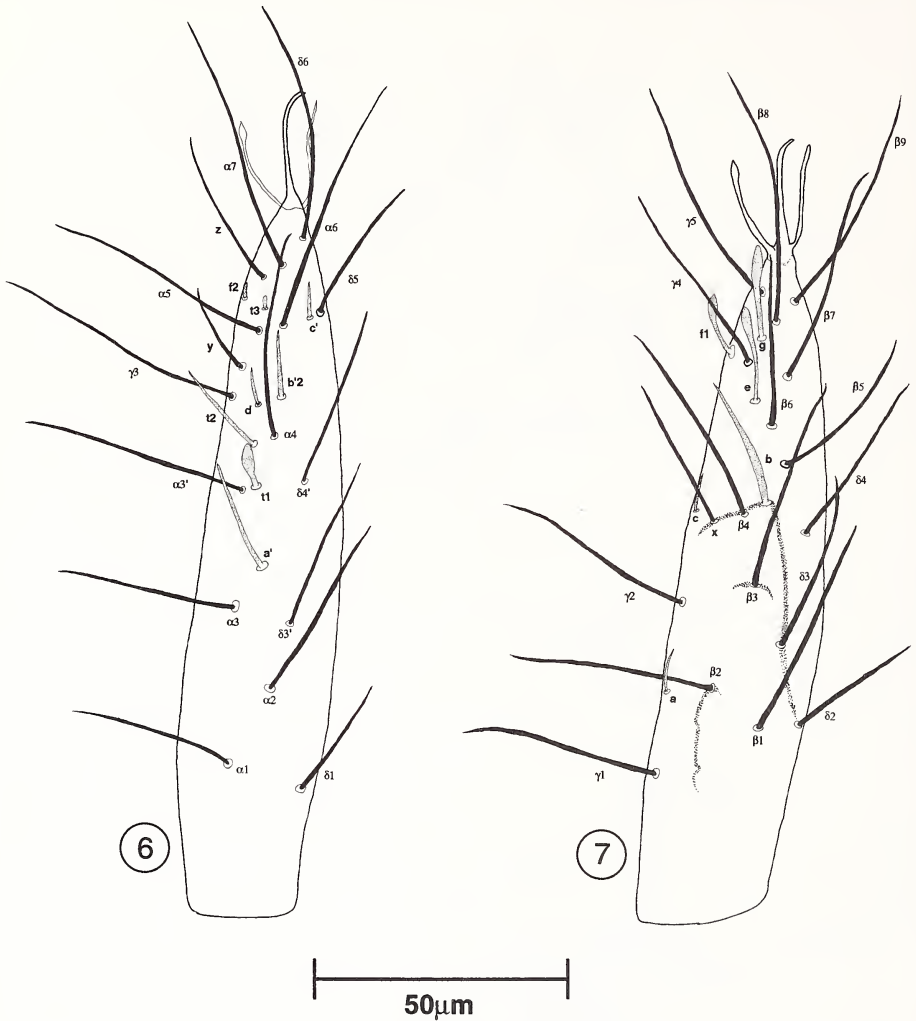
Figs. 1-3. *Eosentomon megatibiense*: 1, Head, dorsal view; 2, Galea; 3, Male squama genitalis; (50  $\mu\text{m}$  scale refers to Figs. 1 and 3; 10  $\mu\text{m}$  scale refers to Fig. 2.)

ittal keel or postoccipital apodeme as described by Copeland (1962) and Tuxen (1964) visible but not distinct.

**Thorax.** Dorsum of pronotum with four posterior setae. Seta  $p1$  1.3 times longer than  $p2$ . (1.28-1.35,  $N = 17$ ). On mesonotum, (Fig. 4) setae  $p1$  slightly longer than  $p1'$  in length. Seta  $p2$  4.2 times the length of  $p2'$  (4.08-4.29,  $N = 17$ ). Seta  $p3$  5.1 times the length of  $p3'$  (4.8-5.4,  $N = 17$ ). Seta  $p3'$  long as width of mesothoracic spiracle. Spiracular gland pore present. Seta  $a2$  long, subequal to  $p2$ . Setal pattern on posterior and lateral margin of metanotum (Fig. 5) same as mesonotum except  $p3$  is 4.1 times longer than  $p3'$  (3.7-4.3,  $N = 17$ ). Seta  $p3$  5.2 times longer than  $p3'$  (4.9-5.4,  $N = 17$ ). Seta  $a2$  long, subequal to  $p3$ . Seta  $p5'$  present and gemmate.



Figs. 4–5. *Eosentomon megatibiense*: 4, Postero-lateral margin of the mesonotum; 5, Postero-lateral margin of the metanotum.



Figs. 6-7. *Eosentomon megatibiense*: 6, Foretarsus, dorsal view; 7, Foretarsus, ventral view.

**Tarsi.** Foretarsi (Figs. 6, 7) without claw  $117.8 \mu\text{m}$  ( $111-122$ ,  $N = 17$ ). Length of claw  $21.7 \mu\text{m}$  ( $21.0-22.5$ ,  $N = 17$ );  $\text{TR} = 5.4$ . Empodium of foretarsi medium,  $\text{EU} = 0.73$ . Meso and metatarsi empodia short.  $\text{EU II} = 0.07$  ( $0.06-0.09$ ,  $N = 1$ ).  $\text{EU III} = 0.08$  ( $0.06-0.08$ ,  $N = 17$ ). Foretarsal sensilla *a* and *c* linear; sensillum *b'1* absent; sensilla *a'*, *b*, *b'2*, *t2*, linear, pointed with same length and shape; sensillum *f1* pointed spatulate; sensillum *a'* medium, not reaching base of *t2*; sensillum *c'* short, pointed, oblong; sensilla *d*, *f2*, and *t3* short, more oblong than oval; sensilla *e* and *g* thinly pointed spatulate clubs similar in size; sensillum *t1* large, inserted close to  $\alpha 3'$  with shank one half the length of club.  $\text{BS} = 1.42$  ( $1.35-1.47$ ,  $N = 17$ ).

Table 1. Abdominal chaetotaxy of *Eosentomon megatibiense* n. sp.

Abd	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Tergum	$\frac{4}{12^a}$	$\frac{10}{16}$	$\frac{10}{16}$	$\frac{10}{16}$	$\frac{8}{16}$	$\frac{8}{16}$	$\frac{8}{16}$	$\frac{6}{9}$	8	8	8	9
Sternum	$\frac{4}{4}$	$\frac{6}{4}$	$\frac{6}{4}$	$\frac{6}{10}$	$\frac{6}{10}$	$\frac{6}{10}$	$\frac{6}{10}$	$\frac{2}{7}$	6	4	8	12

<sup>a</sup> Two primary, two accessory, and two microchaetae on each side.

**Abdomen.** Abdominal chaetotaxy given in Table 1 with pleural setae included with tergal setae. Posterior row of tergum I (Fig. 8) with two primary, two accessory, and two microchaetae. First microchaeta long gemmate. Second microchaeta described by Bernard (1990) and Copeland (1962), located near each posterior corner, not easily distinguished. Tergites I–V (Fig. 9) have primary setae distinctly longer than associated accessory setae. First pair of accessory setae on tergum VII (Fig. 12) one-tenth length of corresponding primaries. Tergum VIII (Fig. 10) with  $p2'$  pointed. Tergal gland easily distinguished. Sternum VIII possessing two anterior and seven posterior setae. Sterna IX and X (Fig. 11) with six and four setae respectively. Precosta of tergites with slightly incised edge as described by Bernard (1990).

**Genitalia.** Female squama (Fig. 13) basal apodemes curving outward; *processus sternales* well sclerotized with caput process shaped like a “robin’s head” in profile. Posterior valves long, consisting of two distinct parts. Male genitalia (Fig. 2) not unusual.

**Holotype.** Female. Slide AK 49-47: Village Creek Park, Arkansas, August 23, 1977. T. Copeland. Type Deposition: American Museum of Natural History (USNM), New York, USA.

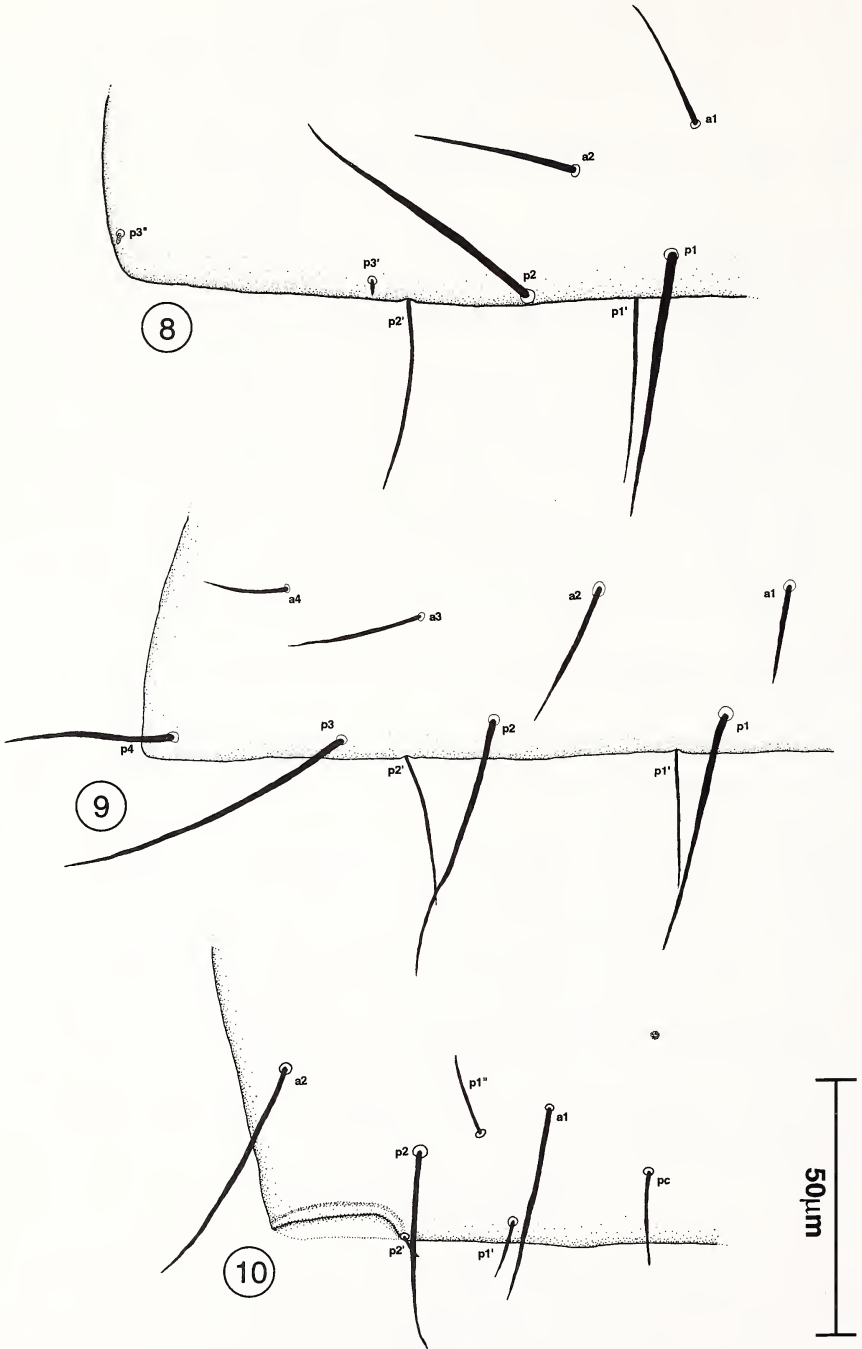
**Paratypes.** 12 females, 4 males. Village Creek Park, Arkansas, August 23, 1977. T. Copeland. Type Deposition: University of Arkansas Arthropod Collection, Fayetteville, Arkansas, USA.

**Etymology.** This species is named after the enlarged prothoracic tibia.

**Discussion.** *Eosentomon megatibiense* displays the 6/4 setal arrangement on sternites IX/X found in *E. quapawense* Tipping and Allen (in press). A key for determination of the members of this group is found at the end of this publication. *Eosentomon megatibiense* appears similar to *E. montanum* (Copeland 1964). Similarities include: same abdominal tergal chaetal patterns, broad straight mandibles, and similar RSR. Differences include: the 6/4 setal arrangement on the IX/X sterna, primary abdominal setae distinctly longer than associated accessories, and sensillum *s* on pretarsus with distinct club. *Eosentomon montanum* exhibits: six setae on both IX/X sterna, primary and accessory abdominal setae subequal in length, and pretarsal sensillum *s* with club extremely small or absent.

*Eosentomon maryae*, new species  
Figs. 14–26

Sample consists of thirty-eight matusus juniors, two males, and one female. Measurements with MJ preceding are derived from the matusus juniors. Only the twenty best MJ specimens were used in determining measurements and ratios. Body pale with little sclerotization; mean length of adults 1,137  $\mu\text{m}$  (1,085–1,152, N = 3); MJ = 897  $\mu\text{m}$  (569–1,074, N = 20).



Figs. 8–10. *Eosentomon megatibiense*: 8, Postero-lateral margin of tergum I; 9, Postero-lateral margin of tergum II; 10, Postero-lateral margin of tergum VIII.



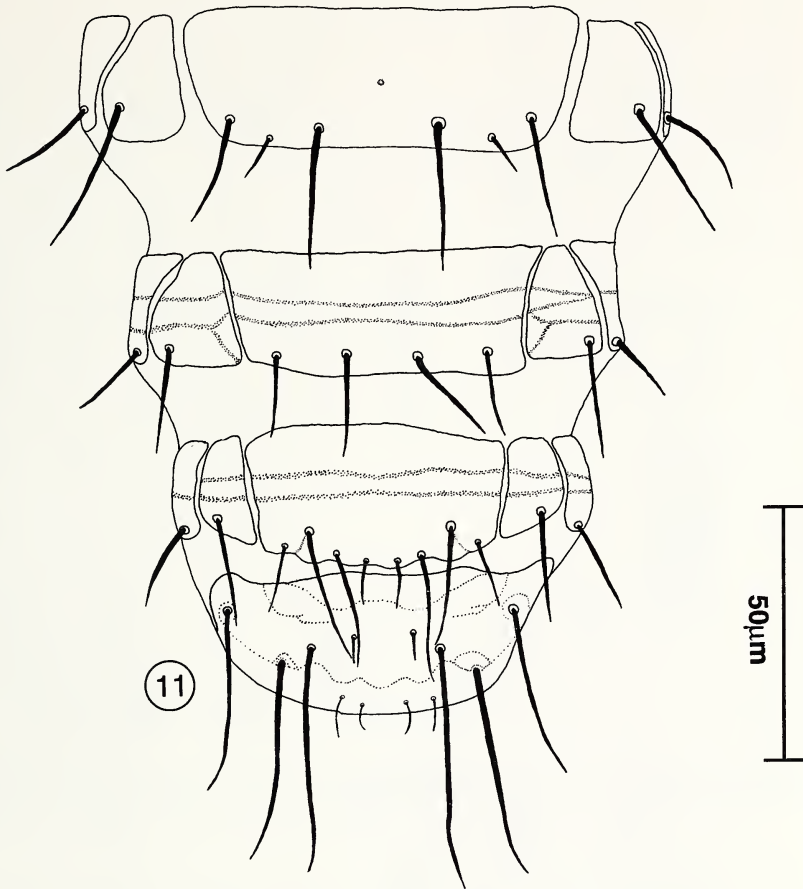
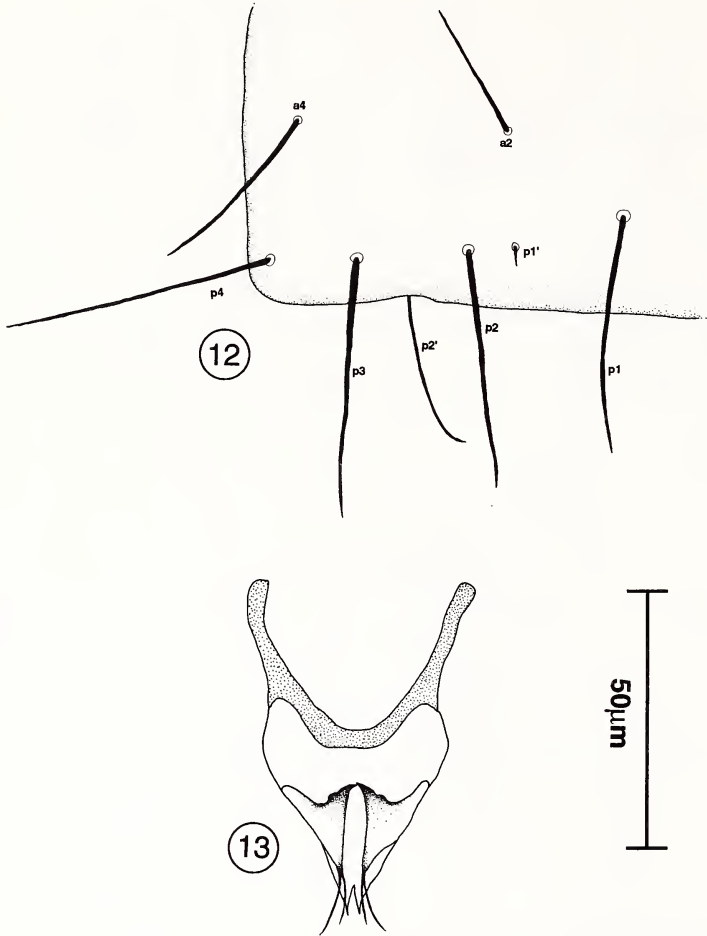


Fig. 11. *Eosentomon megatibiense*: 11, Sterna IX–XII.

**Head.** Head oblong (Fig. 14). Length of head excluding labrum  $108.5 \mu\text{m}$  ( $98.5\text{--}122.0$ ,  $N = 3$ );  $MJ = 97.4 \mu\text{m}$  ( $91.2\text{--}105.4$ ,  $N = 20$ ). Labrum short  $8.6 \mu\text{m}$  ( $7.6\text{--}9.0$ ,  $N = 3$ );  $MJ = 9.7 \mu\text{m}$  ( $9.1\text{--}10.3$ ,  $N = 20$ ) with two setae reaching apex of labium.  $LR = 12.6$  ( $11.7\text{--}13.2$ ,  $N = 3$ );  $MJ = 10.0$  ( $9.5\text{--}10.9$ ). Mandibles short, curved distally with 2 distinct apical teeth. Digits of galea (Fig. 15) well developed. Inner, median and outer digits rounded apically. Exterior spine long, reaching beyond apex of galea. Outer lobe of lacinia slightly curved distally. First pair of rostral setae (I) slightly inflated along basal third.  $RSR$  of both adult and matusus juniors =  $0.70$ . Pseudoculus roughly circular with slight striations in adult, no visible markings in matusus juniors.  $PR = 11.5$  ( $10.8\text{--}11.8$ ,  $N = 3$ );  $MJ = 13.9$  ( $13.3\text{--}14.4$ ,  $N = 20$ ). Cephalic seta *aa* present. Cephalic sensilla *ps* and *as* distinct. Seta *sp* 1.7 times length of seta *p* ( $1.4\text{--}1.9$ ,  $N = 3$ );  $MJ = 1.8$  ( $1.4\text{--}2.1$ ,  $N = 20$ ). Cardio and maxillary ramus of tentorium distinct in the adults, not visible in matusus juniors.

**Thorax.** Dorsum of pronotum with four posterior setae. Seta *p1* 1.2 times longer

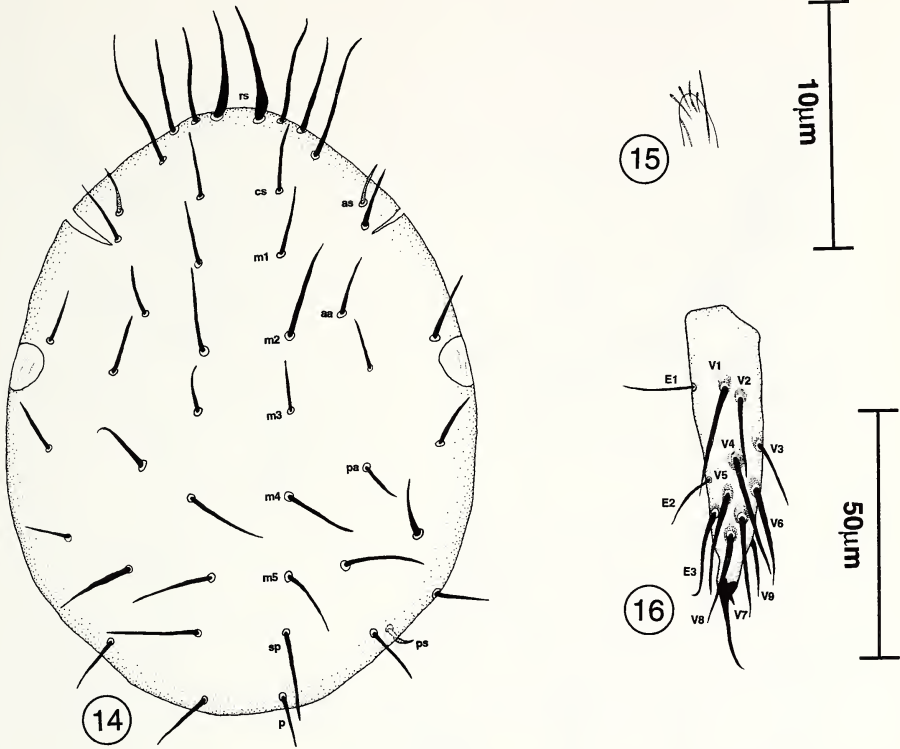


Figs. 12–13. *Eosentomon megatibiense*: 12, Postero-lateral margin of tergum VII; 13, Female squama genitalis.

(1.13–1.39,  $N = 23$ ) than seta  $p2$  for both adult and maturus juniors. Gland openings distinctly visible anterior to seta  $p2$ . Mesonotum (Fig. 17) seta  $p1$  and  $p1'$  subequal in length. Seta  $p2$  3.7 times length of  $p2'$  (3.2–3.9,  $N = 3$ ); MJ = 3.5 (3.2–3.9,  $N = 20$ ). Seta  $p3$  2.8 times length of  $p3'$  (2.7–3.1,  $N = 3$ ); MJ = 2.6 (2.2–2.8,  $N = 20$ ). Seta  $p3'$  as long as width of mesothoracic spiracle. Setal and spiracular gland pattern on posterior and lateral margin of metanotum (Fig. 19) same as mesonotum except for presence of seta  $p5'$ .

**Tarsi.** Foretarsi (Figs. 21, 22) without claw,  $78.2 \mu\text{m}$  (77.6–78.8,  $N = 3$ ); MJ =  $65.7 \mu\text{m}$  (64.8–67.1,  $N = 20$ ). Length of claw,  $17.7 \mu\text{m}$  (16.9–18.1,  $N = 3$ ); MJ =  $15.0 \mu\text{m}$  (14.6–15.7). TR = 4.4 (MJ = 4.5); EU = 0.76 (MJ = 72). Empodia of mesotarsi short. EU II = 0.10 (0.09–0.12,  $N = 3$ ); MJ = 0.10 (0.09–0.12,  $N$

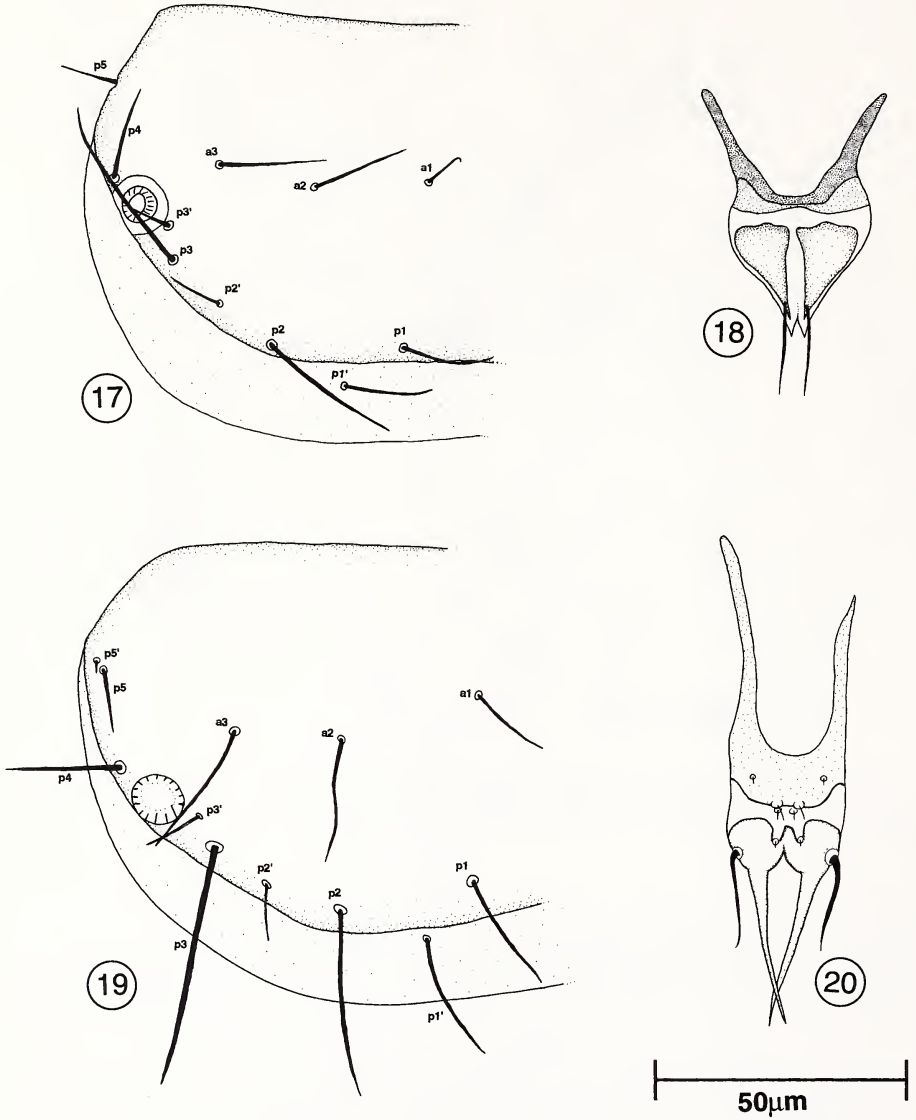




Figs. 14–16. *Eosentomon maryae*. 14, Head, adult, dorsal view; 15, Galea; 16, Metatarsus. (50  $\mu\text{m}$  scale refers to Figs. 15 and 10  $\mu\text{m}$  scale refers to Figs. 14 and 16.)

= 20). Empodia of metatarsi (Fig. 16) short. EU III = 0.12 (0.10–0.14, N = 3); MJ = 0.12 (0.09–0.14). Foretarsal hairs and sensilla in adults and matusus juniors similar except that sensilla *a'* does not reach *t2* in MJ (Fig 23). Foretarsal sensilla *a* and *c* small, linear; sensillum *b'1* absent; sensilla *a'*, *b*, *b'2*, linear; *f1* pointed spatulate; *t2*, linear, pointed; sensillum *a'* linear, long, reaching base of *t2*; sensilla *c'*, *f2*, and *t3* appear short and oblong but not distinct. Sensillum *d* oblong, linear; sensilla *e* and *g* thinly pointed spatulate clubs similar in size; *t1* oval with medium shank inserted closer to  $\alpha 3'$  than to  $\alpha 3'$ . BS = 1.26 (1.14–1.30, N = 3); MJ = 1.10 (1.08–1.12, N = 20).

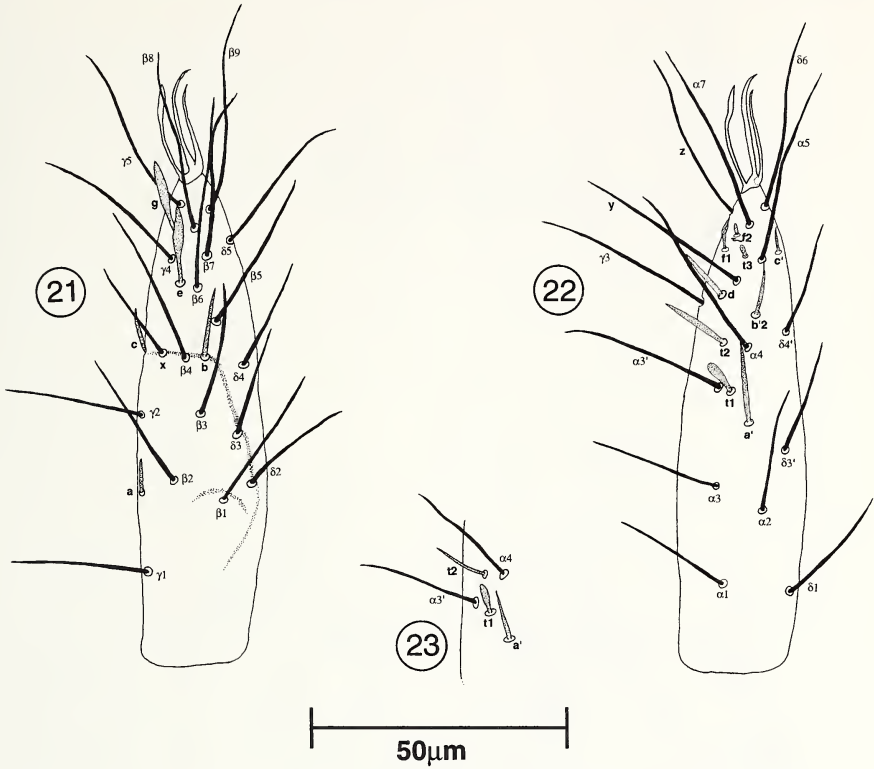
**Abdomen.** Abdominal chaetotaxy with plurals included in terga presented in Table 2. Posterior row of tergum I (Fig. 24) with three primary, one accessory, and two microchaetae. Tergites II–VI (Fig. 25) with accessory posterior setae subequal in length to associated primaries. First pair of accessory setae on tergum VII (Fig. 26) approximately one-fourth length of corresponding primaries, possessing a distinct brush tip. Tergum VIII (Fig. 27) with *p2'* slightly capitulate. Sternum VIII possessing two anterior and seven posterior setae. Sterna IX and X (Fig. 28) with six and four setae respectively. Central lobe of precosta deeply sinuate.



Figs. 17–20. *Eosentomon maryae*. 17, Postero-lateral margin of the mesonotum; 18, Female squama genitalis; 19, Postero-lateral margin of the metanotum; 20, Male squama genitalis.

**Genitalia.** Female squama (Fig. 18) with basal apodemes curving outward; processus sternales well sclerotized. Male genitalia (Fig. 20) not unusually distinctive.

**Holotype.** Female. Slide AK 56-31: Hot Springs National Park, Arkansas, August 26, 1977. T. Copeland. Type Deposition: American Museum of Natural History, New York, USA.



Figs. 21–23. *Eosentomon maryae*. 21, Fortarsus, ventral view; 22, Fortarsus, dorsal view; 23, Fortarsus, matus junior, sensilla *t1* region.

**Paratypes.** 2 males, 20 matures junior. Village Creek Park, Arkansas, August 23, 1977. T. Copeland. Type Deposition: University of Arkansas Arthropod Collection, Fayetteville, Arkansas, USA.

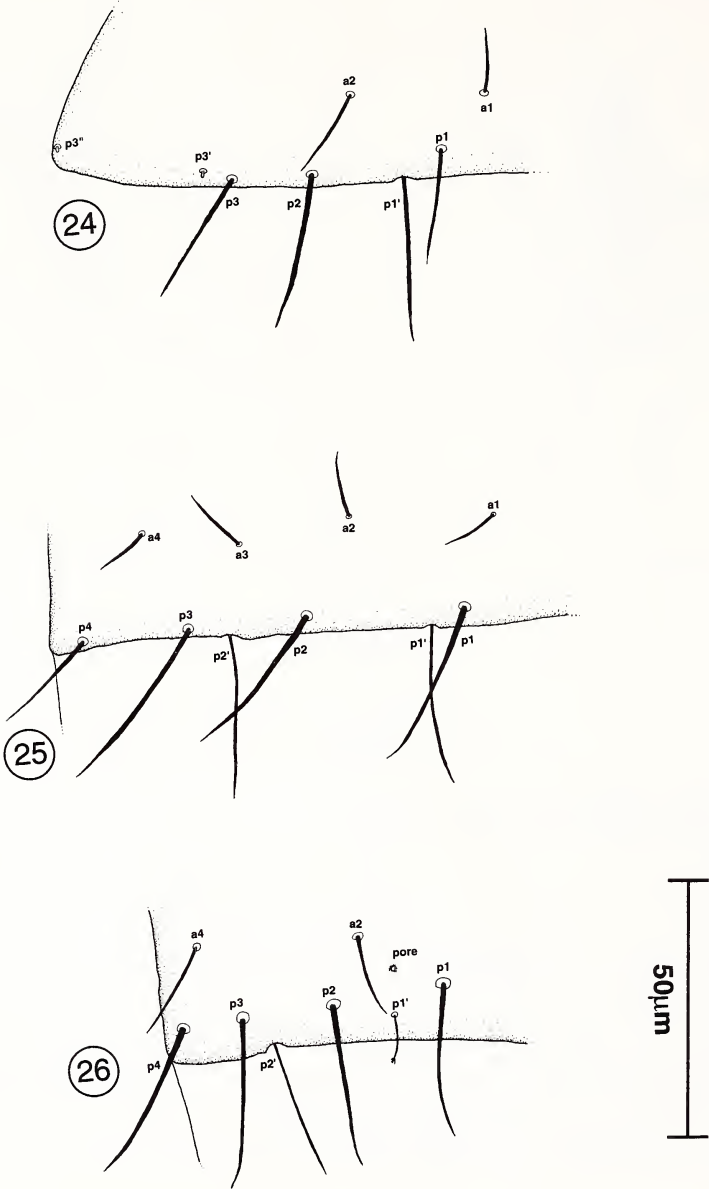
**Etymology.** This species is named after the primary author’s mother.

**Discussion.** *Eosentomon maryae* is distinctive among the other members of *Eosentomon* exhibiting 6/4 setal arrangement on the sternites IX/X. The following key will be useful for separating the species of this group.

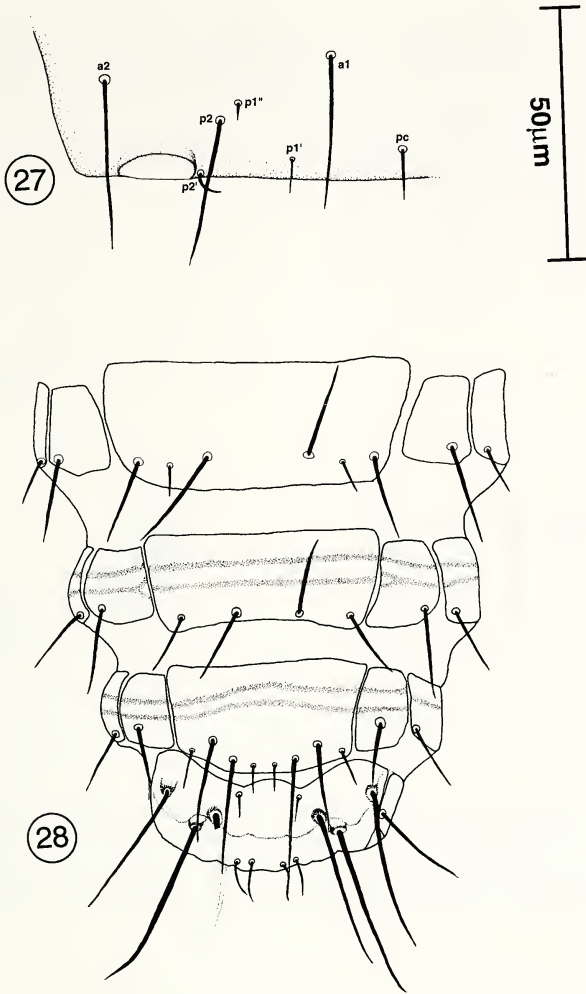
Table 2. Abdominal chaetotaxy of *Eosentomon maryae* n. sp.

Abd	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Tergum	4 12 <sup>a</sup>	10 16	10 16	8 16	8 16	8 16	6 16	6 9	8	8	8	9
Sternum	4 4	6 4	6 4	6 10	6 10	6 10	6 10	2 7	6	4	8	12

<sup>a</sup> Three primary, one accessory, and two microchaetae on each side.



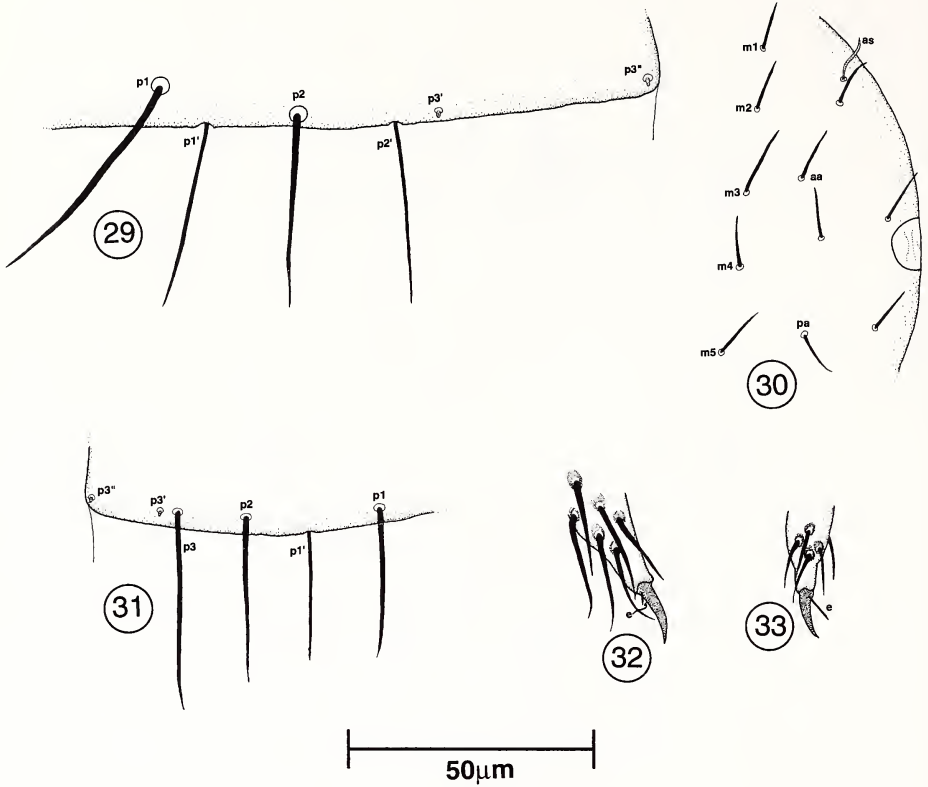
Figs. 24–26. *Eosentomon maryae*. 24, Postero-lateral margin of tergum I; 25, Postero-lateral margin of tergum II; 26, Postero-lateral margin of tergum VII.



Figs. 27–28. *Eosentomon maryae*. 27, Postero-lateral margin of tergum VIII; 28, Sterna IX–XII.

KEY TO SPECIES OF *EOSENTOMON* WITH 6/4 SETAL PATTERN ON STERNA IX/X

1. a. First abdominal terga with 2:2:2 configuration of primary, accessory and microchaeta (Fig. 29) . . . . . *E. megatibiense* Tipping n. sp.
- b. First abdominal terga with 3:1:2 configuration of primary, accessory and microchaeta (Fig. 31) . . . . . 2
2. a. Empodia of metathoracic tarsi long, greater than fifty percent the length of claw (Fig. 33); cephalic seta *aa* absent . . . . . *E. quapawense* Tipping
- b. Empodia of metathoracic tarsi short, less than thirty percent the length of claw (Fig. 32); cephalic seta *aa* present (Fig. 30) . . . . . *E. maryae* Tipping n. sp.



Figs. 29–33. *Eosentomon* sp. 29, Postero-lateral margin of tergum I showing 2:2:2 setal pattern; *Eosentomon maryae*. 30, Lateral margin of head; *Eosentomon* sp. 31, Postero-lateral margin of tergum I showing 3:1:2 setal pattern; *Eosentomon maryae*. 32, Metatarsal claw with empodium; e, empodium. *Eosentomon quapawense*. 33, Metatarsal claw with empodium; e, empodium.

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